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IV.—*The Motion of the Voice, ἡ τῆς φωνῆς κίνησις, in the Theory of Ancient Music.*

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MANY of the Greek treatises on music begin the development of the subject proper by describing and analyzing the changes in pitch which take place in the course of human utterance. The term applied to these changes was *ἡ τῆς φωνῆς κίνησις*. I propose in this paper to consider the nature of this ‘motion,’ the merits and defects of the ancient analysis, and the object of introducing the subject in treatises on musical theory, and then to show what light is thereby thrown for us upon the nature of ancient Greek music.

In almost every sound there is present to a sensible degree the property or quality of musical pitch. Pitch, regarded as a physical phenomenon, may be defined as regularity or periodicity in the vibrations of some suitable medium, such as air or water. Every set of regular or periodic vibrations constitutes what is technically called a simple sound, and the degree of the pitch of this sound depends upon the rapidity of the vibrations. A simple sound of this nature will seldom, if ever, occur in the ordinary course of events. Those sounds which appear to our senses the purest and simplest are in reality compound sounds in almost every instance. The material objects which generate the vibrations in the air are usually of such a nature that not one set of vibrations only, but a number of sets at various rates is produced at one and the same time. Now the effect upon the ear of such a compound sound depends upon the interrelationship of the constituent pitches. If these pitches are not related to one another on certain numerical principles, the sound is a noise. If, on the other hand, a certain relationship exists between them, the sound is a musical sound. For a musical sound is

a complex, formed by a series of simple sounds. Of these the lowest in pitch is generally the loudest. Superimposed upon this lowest pitch there will be found a group of fainter pitches, standing at certain definite distances from one another. These are the so-called overtones, and it is their presence which determines the 'quality' of the sound as a whole. Simple though the sound may seem to the ear, it is, in reality, as it were, a chord, in which all but one of the notes are faint. It is easy to see what a large number of combinations can be formed by varying the intensity of the several overtones, by omitting some and strengthening others. In this way physicists account for the great variety of quality observable in the tones of instruments and voices.

In a musical sound, then, of the constituent related pitches one is predominant. This gives the note its name and position. But in a noise, instead of order among the pitches we have confusion, instead of one predominant pitch, many pitches of considerable intensity.

Now evidently the line between musical sounds and noises cannot always be drawn with certainty. Many sounds, if not strictly musical in the technical sense, yet have one pitch of slightly greater intensity than any of the others. For example, a rap on a table has such a pitch, and many articles of wood, glass, and metal give sounds with recognizable pitches. Particularly is it true of all vocal utterances that a height or position on the scale of acuteness and graveness can be assigned to them. This is the case not only with such inarticulate sounds as coughing and laughing, but to a special degree with the sounds of articulate speech. This fact then must be emphasized. All speech, spoken as well as sung, is characterized by the presence of pitch.

Now the tones of the voice in singing and in ordinary conversation are obviously different. In what does the difference consist?

In the first place it would seem that the difference is due very largely to the different degree of clearness with which the predominant pitch is brought out. The loudness of the lowest of the constituent pitches is made greater in singing

than in speaking. A second difference, but little less important, is due to the different manner in which the pitch changes from time to time, and it is these changes which the ancient treatises on music consider under the term $\dot{\eta} \tau\hat{\eta}s \phi\omega\hat{\eta}s \kappa\hat{\eta}\nu\sigma\iota s$, the primary object being to differentiate the speaking and the singing voice.

Aristoxenus, if we may trust his own statement, was the first to treat of this subject of the motion of the voice in a satisfactory way. At any rate his method is more or less closely followed by a number of subsequent writers. Such are Aristides Quintilianus, Pseudo-Euclid (the author of the *Introductio Harmonica*), and Gudentius. Other writers on the theory of music employ another method of effecting the differentiation of the two kinds of utterance. Chief among these is the geographer and astronomer, Claudius Ptolemy. His method is to analyze and classify sounds so as to show the position which musical sounds occupy among sounds in general. But the classification of Aristoxenus is not a classification of sounds at all, but of the ways in which a certain property found in certain sounds, though not in all, may behave during the existence of the sounds in question. This property is, of course, pitch, and the sounds are the articulate sounds of the human voice. If the tones of musical instruments are sometimes included in the term $\phi\omega\hat{\eta}$ (Aristoxenus has the phrase $\phi\omega\hat{\eta} \delta\rho\gamma\alpha\nu\kappa\hat{\eta} \tau\epsilon \kappa\hat{\alpha}l \grave{\alpha}\nu\theta\rho\omega\pi\kappa\hat{\eta}$), it is by analogy with the tones of the human voice.

Now pitch can vary in one respect only, that is, in respect to its degree of acuteness, or graveness. There is only one dimension, and this is indicated by the metaphorical use of the terms 'high' and 'low' as applied to pitch. If, then, we desire to indicate graphically on a plane surface the nature of any pitch changes under consideration, we can do so by supposing variation in pitch to take place vertically, and by combining with this motion a horizontal motion, as from left to right, to represent the passage of time.

By the term $\kappa\hat{\eta}\nu\sigma\iota s \tau\hat{\eta}s \phi\omega\hat{\eta}s$ Aristoxenus means the movement of the pitch of the voice from high to low and *vice versa*, and by the term $\sigma\tau\acute{\alpha}\sigma\iota s$ the absence of any such

motion in the pitch. Another term for the latter conception is *ἡρεμία φωνῆς*. Of the movement there are two forms, the continuous, *συνεχής*, and the intervallar, *διαστηματική*. Says Aristoxenus, *Harmonica*, I. § 26, p. 8 Meib. : "In the continuous movement the voice appears to the senses to traverse a certain space in such a way that it rests nowhere, not even, so far as our conception of the sensation goes, at the bounds, but is borne along continuously until the sound ceases. In the other movement, which we call intervallar, the voice appears to move in a contrary manner. In its course it rests on one pitch and then again on another, and doing so continually (*συνεχῶς*), — I mean continually in point of time, — passing over the spaces included by the pitches, but resting on the pitches themselves and sounding these alone, it is said to sing (*μελῳδεῖν*), and to move in the intervallar manner." And a little further on (§ 27) : "For, in general, when the voice moves in such a way that it seems to the ear to rest nowhere, we call the movement continuous. But when, after seeming to rest at a place, the voice then appears to traverse a certain space, and having done this seems to rest again on another pitch and continually keeps on doing this alternately, we call such a movement intervallar."

On a chart of the nature indicated above continuous motion is represented by oblique lines or by wavy lines of which no part is horizontal, except instantaneously ; intervallar motion is shown by a series of horizontal lines, disconnected, with no part of one over another. Thus :

FIG. 1.



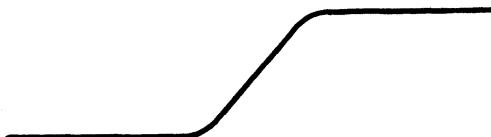
FIG. 2.



At this point it seems best to remark that the musical phenomenon denoted by the term *portamento* is evidently a combination of these two sorts of motion : first a steady sound without variation in pitch, then a rapid passage from this original height, upward or downward as the case may

be, to a certain new height, and finally again a steady sound at the new height. This process is represented by the following figure :

FIG. 3.



It appears, then, that in the continuous style of motion not only is the variation in pitch continuous, but the pitch never ceases to vary until the sound stops, while in the intervallar style change takes place by leaps and in no other way. In the one case there is never steadiness in the pitch, even for a moment; in the other there is a series of steady pitches.

In what sense, then, can one speak of motion in a case where, as in the intervallar motion of Aristoxenus, the moving object takes no positions intermediate to the initial and final positions? The change from one pitch to another is in the nature of a transformation rather than a transference. Is not the sense of identity of sound lost in this change from one degree of pitch to another? Why should we not call the new pitch a new sound? For, if the second pitch began before the first had ended, we should be compelled to call the two pitches two sounds.

In regard to these difficulties, we must remember in the first place that the classification of Aristoxenus does not deal with separate sounds, but with the whole body of sound proceeding from a single source. It was natural to consider one voice alone, when part-singing was practically unknown. In the second place, the words *κινέω* and *κίνησις* seem to have had a signification broader than that of physical motion, whether used literally or metaphorically. This is clear from a passage in the *Theaetetus*. Socrates, in discussing the doctrine of Heraclitus that all things are in motion, asks (*Theaet.* 181 D) if there are not two kinds of *κίνησις*. One is (Jowett's translation) "when a thing changes from one

place to another, or goes round in the same place." The other is "when a thing grows old, or becomes black from being white, or hard from being soft, or undergoes any other change, while remaining in the same place. . . . There are then these two kinds of motion, 'change,' and 'motion in place' (*ἀλλοίωσις* and *περιφορά*)."*Kίνησις*, it would then seem, has a broader meaning than simply physical motion, namely 'change,' whether of position or of condition and nature. It covers transformation as well as transference. In this view *κίνησις διαστηματική* can be regarded as *κίνησις* in this broadest sense.

The identification of *κίνησις συνεχής* with conversational speech and of *κίνησις διαστηματική* with the singing voice is made by Aristoxenus in the following terms (*Harm.* I. § 28, p. 8. M.): "Now the continuous movement is, we assert, the movement of conversational speech (*λογικὴν εἶναι*), for when we converse, the voice moves through a space in such a manner as to seem to rest nowhere. In the other movement, which we call intervallar, the contrary process takes place. For the voice seems to rest [at various pitches], and all say of a man who seems to do this, that he no longer speaks, but sings. Therefore in conversing we avoid having the voice rest unless we are forced at times by reason of emotion to resort to this style of movement [we make the same criticism when we say of a person that he speaks or reads in a sing-song voice]; but in singing we do the reverse, for we avoid the continuous and strive to make the voice rest as much as possible. For the more we make each of the sounds one and stationary and the same, so much the more accurate does the singing seem to the senses. It is fairly plain from the above that of the two movements of the voice in respect to space, the continuous belongs to conversational speech, the intervallar to song."

Such is the scheme of pitch-variations as we have it in Aristoxenus. In spite of its faults it has unquestionably considerable value in that it is based on the evident difference in the manner in which pitch affects human utterance as spoken and as sung.

Perhaps Ptolemy felt the objections which may be brought against the Aristoxenean classification. At any rate his classification is a classification not of kinds of voice-movements, but of kinds of sounds. According to him sounds are either unchangeable in regard to their pitch, *ἴσότονοι*, or changeable, *ἀνισότονοι*. The latter in turn are continuous, *συνεχεῖς*, or discrete, *διωρισμένοι*.

Thus : $\psi\acute{o}phoi \left\{ \begin{array}{l} \text{ἴσότονοι} \\ \text{ἀνισότονοι} \end{array} \right\} \left\{ \begin{array}{l} \text{συνεχεῖς} \\ \text{διωρισμένοι} = \phi\thetaóγγοι. \end{array} \right.$

This classification too, on examination, turns out to be illogical in one respect. The trouble in Ptolemy's arrangement is that one sort of sounds appears twice. Are not *ψόφοι ἀνισότονοι διωρισμένοι* really *ἴσότονοι*, or at any rate a group of *ἴσότονοι*? The description of such sounds seems to show that this is so. One thing is clear, that the subdivision into *συνεχεῖς* and *διωρισμένοι* is simply the Aristoxenean *κίνησις τῆς φωνῆς* in another garb.

Aristides Quintilianus makes a decided improvement on Aristoxenus' treatment of the *κίνησις*. First he distinguishes two classes of *κίνησις*, *κίνησις ἀπλῆ* and *κίνησις οὐχ ἀπλῆ*. Of the latter there are three species, *συνεχής*, *διαστηματική*, and *μέση*.

$\kappa\acute{\iota}\eta\sigmais \left\{ \begin{array}{l} \text{ἀπλῆ} \\ \text{οὐχ ἀπλῆ} \end{array} \right\} \left\{ \begin{array}{l} \text{συνεχής} \\ \text{μέση} \\ \text{διαστηματική} \end{array} \right\}$

The first two, continuous motion and intervallar motion, are so described as to leave no doubt that they correspond exactly to the motions so named by Aristoxenus. In regard to the 'intermediate' motion, it would appear that it is composed of both the other species (*ἔξ ἀμφοῦ συγκειμένη*), and we are further informed that it is used when we read poetry (*μέση δὲ, ἢ τὰς τῶν ποιημάτων ἀναγνώσεις ποιούμεθα*). Referring back to our figures, in which we represented the two Aristoxenean motions, let us combine their characteristics. The

result must show, on the one hand, pitch-variation taking place while the sound is actually being produced, on the other, sounds of a steady pitch. The combination is precisely that which is effected by the phenomenon of *portamento*. We may conclude, therefore, that *κίνησις μέση*, that form of pitch-movement which accompanies the recitation of poetry, as observed by Aristides, consists not only of a musical intonation of the syllables at various degrees of pitch, but also of glides in pitch from degree to degree. Such a style of utterance is more musical than conversational speech in respect to the employment in it of sounds whose pitch is constant, or steady, and more conversational than music proper in respect to the free use of fluctuating pitch. Without running into the danger of drawing conclusions unwarranted by the facts, we may assume that the element of pitch was brought out much more clearly in the kind of motion we are considering than in ordinary conversational speech; and further, that, if the pitch of the voice rested, remained steady, at certain degrees, it must have done so during an appreciable interval of time, and if so, the metrical quantity of the syllables must have been made more evident than is possible in the case of the spoken sentence.

Coördinate with *κίνησις μέση* in Aristides' scheme were *κίνησις συνεχής* and *κίνησις διαστηματική*. These three cover, and more than cover, the whole of the Aristoxenean *κίνησις τῆς φωνῆς* or pitch-variations in general. In Aristides they form a class, *κίνησις οὐχ ἀπλῆ*, which is coördinate to *κίνησις ἀπλῆ*. The meaning of the latter term is made plain from the statement at p. 9 M.: *πᾶσα μὲν οὖν ἀπλῆ κίνησις φωνῆς, τάσις*. That is, *ἀπλῆ κίνησις* is simply a musical sound, in which there is by definition no variation in pitch. The movement then is of another sort, to wit, movement in time, which is horizontal motion on our charts. In the other class, *κίνησις οὐχ ἀπλῆ*, two kinds of motions are combined to form a compound motion; variation in pitch is added to progression in time. A comparison between this classification and that of Ptolemy will show a certain similarity. In both it would seem to be a fault that the elements which consti-

tute one of the lower classes should also find a place in a higher class.

A further extension of the classification of the kinds of κίνησις was sometimes made. Gaudentius subdivides κίνησις διαστηματική into two kinds, ἐμμελής and ἐκμελής, and makes a corresponding subdivision of διαστήματα into διαστήματα ἐμμελῆ and διαστήματα ἐκμελῆ. These terms mean respectively ‘usable in music’ and ‘unusable in music,’ and refer, of course, to the size of the intervals. The same distinction is made by Bacchius Senior, but the term πεζός is used instead of ἐκμελής, and it is musical sounds, not intervals, which are distinguished. When applied to sounds and not to intervals all these terms must be understood to involve a tacit reference to their relationship to other sounds. *Introductio*, p. 16 M. “How many kinds of musical-sounds (φθόγγοι) do we say that there are?” — “Two. One kind we call ἐμμελεῖς, the other πεζοί.”

“What kind of musical-sounds are ἐμμελεῖς?” — “Those which people use in singing and in playing instruments. . . .”

“What kind of musical-sounds are πεζοί?” — “Those which orators use and in which we talk (*λαλοῦμεν*) to one another. Ἐμμελεῖς φθόγγοι have definite (*ώρισμένα*) intervals, the πεζοί indefinite (*ἀόριστα*).”

Now a φθόγγος is always defined as a sound which has a steady pitch (hence I translate it by ‘musical-sound’), and the word is so defined by Gaudentius. For that reason, if λαλεῖν means ordinary conversation, the glides which are characteristic of conversational speech are ignored. Even if they are admitted, our author would seem to differ from Aristoxenus in allowing the voice during ‘continuous motion’ to rest at pitches long enough to permit one to speak of intervals.

We have seen what is meant by the term ἡ τῆς φωνῆς κίνησις. The phenomenon of pitch-variation in both the sung and the spoken sentence is a most natural one, and the two styles of variation characterize and distinguish the musical and non-musical utterance of a modern language, no less, of course, than that of an ancient language. Now a treatise on the theory of music may very properly begin with a

definition of the unit or element of music, the musical sound. So modern treatises usually define the musical sound as distinguished from the non-musical sound. So also does the Aristoxenean analysis of the *κίνησις τῆς φωνῆς* serve to fulfil this purpose. But it does much more than this. It defines not only the nature of the sounds which constitute music, and that too much more fully than seems necessary, but also the nature of the pitch-element in the spoken sentence. Why was it that the analysis of *κίνησις* was not inappropriate in a Greek treatise on the theory of music?

To this question one answer suggests itself immediately. The Greek language, as is well known, had a more highly developed system of high and low pitches for spoken words than have modern languages. Each word seems to have had a more or less fixed scheme of intonation. This is evidenced by the system of written accents. As a result, in every Greek sentence there is involved a definite form for the successive rises and falls of pitch, in which it is very likely that the amount of variation from the mean pitch of the speaker's voice was by no means definite, but the sequence of acute and grave was fixed and not subject to personal caprice. This variation of pitch, which took place of course in the 'continuous' style of motion, Aristoxenus calls *λογώδες τι μέλος*. Says he (§ 42): "For we often indeed speak of a certain conversational melody, namely, that which results from the accents of the words; for it is natural to raise and lower the pitch in conversation." Familiarity with this kind of melody would lead to an effort to distinguish it from melody proper. If, as we suppose, the spoken utterance of ancient Greek was of a quasi-musical nature, it was natural to contrast the melodic feature of the one form of utterance with that of the other.

Another consideration which I would advance by way of explanation for the use of the *κίνησις* in the treatises concerns a characteristic of ancient music about as foreign to modern music as one can well imagine. I refer to the existence of the different *genera*, to which there is nothing comparable in modern music.

The nature of the Greek scales must first be briefly indicated. The earliest scale seems to have been the tetrachord, or system of four notes, in which the extremes stood at the consonant distance of a perfect Fourth. Both the number of notes is small and the compass is narrow. By the time of Terpander the scale had expanded to seven notes, which probably formed a double tetrachord, the middle note serving as upper end of one tetrachord and lower end of the other. Terpander made some change in this heptachord of which the nature is not perfectly clear. It would appear, however, that he increased the compass to the full Octave interval, without increasing the number of notes. There seem to have been objections to abandoning the traditional number seven. Timotheus, the poet and musician, met with strong opposition when he introduced the innovation of using eleven and twelve strings on his cithara. The octave scale of eight notes comes into use soon after the heptachord. The scale was formed of two tetrachords plus the interval of a whole Tone. When, the Tone was at the end of a scale, the two tetrachords were contiguous and were called *συνημμένα* (conjunction); when the Tone was in the middle and separated the tetrachords, it was called the Disjunctive Tone, and the tetrachords were *διεξενυγμένα* (disjunct).

Soon after the time of Aristoxenus, cir. 330 (who does not allude to a longer scale than the octachord), and apparently before Euclid, the mathematician (if the *Sectio Canonis* is his), the scale had developed through additions to both ends until its compass was two octaves and the number of notes fifteen. This was the so-called Perfect System. Still further expansion followed. The notation provides for more than three octaves of notes.

Now in all stages of development, it is not the Octave, but the Fourth, which is made the basis of the Greek scale. The tetrachord retains the important place which it had according to tradition in primitive music. Every scale was regarded as consisting of a series of conjunct and disjunct tetrachords. This gave to a certain number of notes a prominent position as the bounding notes of tetrachords. Given the pitch of

any one of them, that of all the others stood in a fixed relation to the given pitch — that is to say, the intervals separating any two of these notes was either a Fourth, a Fifth (that is, a Fourth and a whole Tone), or the sum of these, an Octave, or an Octave combined with one of the others. Therefore the intonation of these notes, depending as it did on consonant intervals, was fixed, relatively one to another, by nature, as it were. In ancient theory they were called 'standing notes' ($\phiθόγγοι ἑστῶτες$).

There remain for consideration the notes which come between the fixed or standing notes. These occurred in couples and divided the interval of the Fourth into three smaller intervals. Now the peculiar feature in Greek music referred to is that the intonation or position in pitch of these intermediate notes was of a most uncertain nature. In one style of melody these notes would stand at such and such distances from the fixed bounds of the tetrachord; in another style at quite other distances. The ancient theorists, by using the relative lengths of the strings required for producing the various sounds, measured, with quite sufficient accuracy for the purpose, the width of the intervals which separated these notes; and so were able to classify the various kinds of intervallar succession. In this way the so-called *genera* came into existence. These were three in number — the diatonic genus, the chromatic genus (by no means to be confounded with the chromatic scale of modern music), and the enharmonic genus. Roughly speaking, we may define the diatonic genus as that in which the succession of intervals was Semitone, Tone, Tone; the chromatic as Semitone, Semitone, and (a larger interval) Tone-and-a-half; and the enharmonic as Quarter-tone, Quarter-tone, and Di-tone (*i.e.* two whole Tones). But this is by no means the end of the matter. Species of the genera were recognized. These were the *chroae* or 'colors,' in which the succession of intervals was slightly different from that of the more normal varieties. An example will suffice to show their nature. There were, according to Aristoxenus, *Harm.* I. § 54, p. 50 M., three species of the chromatic of the following

nature : $\tau\ddot{o}\ \tau\omega\nu\alpha\iota\omega\nu\chi\rho\hat{\omega}\mu\alpha$, consisting of two Semitones and a Trihemitonion ; $\tau\ddot{o}\ \eta\mu\omega\lambda\iota\omega\nu\chi\rho\hat{\omega}\mu\alpha$, of two intervals each three-quarters of a Semitone in size, together with an interval equal to three and a half Semitones ; and, third, $\tau\ddot{o}\ \mu\alpha\lambda\alpha\kappa\delta\omega\nu\chi\rho\hat{\omega}\mu\alpha$, of two intervals each two-thirds of a Semitone in size, together with an interval equal to three and two-thirds Semitones. For these calculations it is necessary to consider differences in pitch of only a twelfth of a Semitone in extent.

There is still other evidence in abundance that the varieties of intervallar succession within the compass of the tetra-chord, the Fourth, were very numerous, and that too important. Other theorists give other intervals for species of the same names as the Aristoxenean species. In many cases we may doubtless assume that errors in the measurements are the cause of the discrepancies. In other cases it is open for us to suppose that there was a difference of usage in regard to any particular genus from time to time. But in general it must be true that there were in actual use at any given period at least as many kinds of tetrachords as we find recorded in the works of any single trustworthy authority, like Aristoxenus, for example. It must be that the different genera and chroae really existed. Many students of Greek music, possibly most of them, find it incredible that the minute differences between the various kinds of tetrachords had any other than a theoretical existence. But is it not much more incredible that all the ancient theorists either imagined differences which did not exist or falsified their report of the state of affairs ? We must not try to make the music of the ancients conform to modern ideas on the subject. Modern music has had a rapid and wonderful development. The most important feature in this development is the use of the principle of simultaneous harmony. But the artistic effects to be gained by sounding two or more notes together were not appreciated by the ancients, except in a rudimentary way. Now in the case of the primary consonances, the Octave, Fifth, and Fourth, it is important for obvious reasons that the interval should be accurately tuned, as well for use in melody as in harmony. But there is no

reason in ancient music why the dissonant intervals should be so tuned. Even in modern music in the case of intervals like the Major and Minor Thirds and Sixths, intervals which are now regarded as consonant, there may be considerable inaccuracy in the intonation of the notes without causing the effect to be disagreeable, not only when they are successive notes, but also, to a certain extent, when they are simultaneous notes. Ancient music, unaffected by such considerations of harmony, was free. And this is the reason that we find such a surprising variety of intonations for all notes but the few so-called standing notes. As distinguished from these, the variable notes were called in ancient theory ‘moving notes’ (*φθόγγοι κινούμενοι*).

The state of affairs then in regard to the pitch of many of the notes was one of great flexibility. To us who are habituated to fixity in the intonation of the notes, this seems most unnatural. But the non-harmonic music of many semi-civilized and barbarous races to-day is proof of the possibility of this sort of thing.

So, while fixity is in modern music both a necessity and a second nature, in ancient music mobility is the rule and the distinguishing feature. Under such circumstances, it is not surprising that this side of melody should present itself to the ancient theorists as a matter of great importance. The limits within which a given note of the movable kind might ‘move’ were carefully laid down, and the distance between a note’s highest possible pitch and its lowest was called its space or region (*τόπος*). Moving of this sort is not, to be sure, moving in quite the same sense as the moving which seems to take place in melody, for we are not to understand that more than one genus was used at once, but we do know that there were frequent shifting from genus to genus within the piece of music, and such changes of pitch cannot fail to impress one with the idea of motion.

The importance of the *κίνησις* in the theory of ancient music is then due to its connection first with the accentuation of the Greek language, and secondly with the general question of the intonation of the notes in Greek music.